

18 APR 2000

## Sertifikaat

REPUBLIEK VAN SUID-AFRIKA

## Certificate

PATENTKANTOOR

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DEPARTEMENT VAN HANDEL  
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REPUBLIC OF SOUTH AFRICA

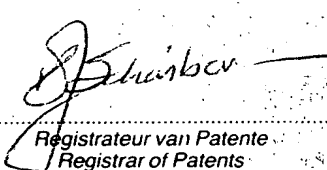
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RECD 26 APR 2000

- 1) South African Patent Application No. 2000/0259 accompanied by a Provisional Specification was filed at the South African Patent Office on the 21 January 2000, in the name of Potchefstroom University for Christian Higher Education in respect of an invention entitled: "Method and apparatus for producing ozone".
- 2) The photocopy attached hereto is a true copy of the provisional specification and drawings filed with South African Patent Application No. 2000/0259.

in die Republiek van Suid-Afrika, hierdie  
in the Republic of South Africa, this 22nd dag van  
day of

March 2000

  
Registrateur van Patente  
Registrar of Patents

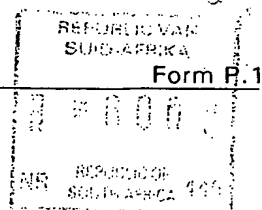
2000/01-259  
D.M. KISCH INC., Johannesburg

REPUBLIC OF SOUTH AFRICA  
PATENTS ACT, 1978

APPLICATION FOR A PATENT AND ACKNOWLEDGEMENT OF RECEIPT

(Section 30 (1) - Regulation 22)

The grant of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate.



PATENT APPLICATION NO.		
21	01	20000259

AGENT'S REFERENCE
P/00/78109

FULL NAME(S) OF APPLICANT(S)

71	POTCHEFSTROOM UNIVERSITY FOR CHRISTIAN HIGHER EDUCATION
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ADDRESS(ES) OF APPLICANT(S)

	1 Hofmann Street Potchefstroom
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TITLE OF INVENTION

54	METHOD AND APPARATUS FOR PRODUCING OZONE
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	THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANYING FORM P.2. The earliest priority claimed is
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	THIS APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO.	21	01
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	THIS APPLICATION IS A FRESH APPLICATION IN TERMS OF SECTION 37 AND BASED ON APPLICATION NO.	21	01
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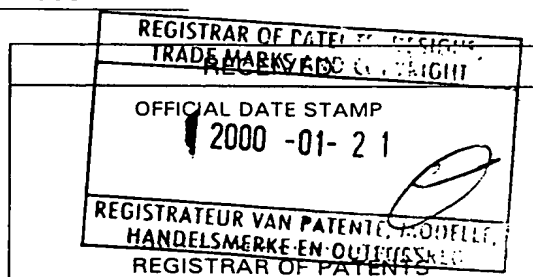
THIS APPLICATION IS ACCOMPANIED BY :

X	1	A single copy of a provisional <del>xxx</del> copies of a complete specification of 8 pages.
X	2	Drawings of 6 sheets.
	3	Publication particulars and abstract ( Form P.8. in duplicate ).
	4	A copy of Figure of the drawings for the abstract.
	5	An assignment of invention.
	6	Certified priority document(s) ( State number ).
	7	Translation of priority document(s).
	8	An assignment of priority rights.
	9	A copy of Form P.2 and specification of S.A. Patent Application No. 21 01
	10	A declaration and power of attorney on Form P.3.
	11	Request for ante-dating on Form P.4.
	12	Request for classification on Form P.9.
	13	

DATED THIS 21 st DAY OF January 2000

Patent Attorney for the Applicant(s)

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Form P.6

**REPUBLIC OF SOUTH AFRICA**

**PATENTS ACT, 1978.**

**PROVISIONAL SPECIFICATION**

( Section 30 (1) - Regulation 27 )

PATENT APPLICATION NO.			LODGING DATE.		AGENT'S REFERENCE
21	01	20000259	22	21-01-2000	P/00/78109

FULL NAME(S) OF APPLICANT(S)	
71	POTCHEFSTROOM UNIVERSITY FOR CHRISTIAN HIGHER EDUCATION

FULL NAME(S) OF INVENTOR(S)	
72	VISSER, Barend

TITLE OF INVENTION	
54	METHOD AND APPARATUS FOR PRODUCING OZONE

**INTRODUCTION AND BACKGROUND TO THE INVENTION**

This invention relates to an improvement to the method and apparatus for producing ozone described in the specification of South African provisional patent application number 99/1479.

5

Since filing the above patent application, the applicant has made certain improvements to the above apparatus and method.

10 **OBJECT OF THE INVENTION**

It is accordingly an object of the present invention to provide improvements to the apparatus and method described in the specification of South African provisional patent application number 99/1479.

15

**SUMMARY OF THE INVENTION**

According to a first aspect of the invention there is provided a method of producing ozone, the method including the steps of:

- providing a housing having an inlet and an outlet;
- 20 - disposing an electrode in the housing;
- passing oxygen - containing fluid through the housing from the inlet to the outlet; and

- energising the electrode such as to cause discrete bursts of corona discharges in the housing, to produce ozone from the oxygen - containing fluid, at a rate such that a relative potential difference of at least 20 kV per millimeter is generated on the electrode, in less than 1 nanosecond.

Preferably a relative potential difference of at least 20 kV per millimeter is generated on the electrode in less than 1 nanosecond.

- 10 The Applicant has found that by generating a potential difference of at least 20 kV per millimeter in less than 1 nanosecond, instantaneous ionisation of oxygen is achieved without substantial heat generation.

According to a second aspect of the invention there is provided apparatus for producing ozone, the apparatus including:

- a housing having an inlet and an outlet;
- a passage for oxygen extending from the inlet to the outlet;
- an electrode disposed in the passage; and
- pulse generating means for intermittently changing the relative potential difference of the electrode at a rate faster than 20 kV per millimeter per nanosecond.

Further according to the invention, the electrode is annular.

The housing may be of a conductive material.

- 5 The housing may define an annular ridge formation which is closely spaced from the annular electrode.

The ridge formation may be insulated from the electrode by an insulating layer or member.

10

The passage may extend through the space between the ridge formation and the electrode, the arrangement being such that a corona discharge is established in said space.

15 **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will now be described further, by way of example only, with reference to the accompanying drawings wherein:

- figure 1 is a perspective exploded view of apparatus according to a first embodiment of the invention for producing ozone;
- 20 figure 2 is a perspective exploded view of an electrode of the apparatus of figure 1;
- figure 3 is a perspective assembled view of the electrode of figure 2;

- figure 4 is a cross-sectional side view along lines A - A' in figure 3;
- figure 5 is a partially broken away perspective view of apparatus according to a second embodiment of the invention for producing ozone; and
- 5 figure 6 is a cross-sectional side view of a central portion of the apparatus of figure 5.

#### DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

- 10 Referring to figure 1, apparatus according to a first embodiment of the invention for producing ozone, is generally designated by reference numeral 10.

Referring further to figures 2 to 4, the apparatus 10 includes a tubular anodised aluminium housing 12 having an open end 14 and a closed end 16, and a  
15 closure 18 for closing the open end. The apparatus 10 further includes an electrode assembly 20 mountable on the closure 18 and pulse generating means in the form of a self-oscillating electronic circuit (not shown) for energising the electrode assembly 20.

- 20 An inlet 22 is provided in the closed end 16 and an outlet 24 is defined in the closure 18. A passage extends from the inlet 22 to the outlet 24.

The electrode assembly 20 comprises an insulating disc or base 20.1 and an annular electrode 20.2 mounted on one face of the base 20.1 opposite the closure 18. The base 20.1 is provided with a plurality of spaced openings 20.3 the purpose of which becomes clear below.

5

The closure 18 is provided with an annular ridge formation 18.1, for establishing a corona discharge in the region of the electrode 20.2. When the electrode assembly 20 is mounted on the closure 18, the ridge formation 18.1 is disposed in close proximity (approximately 0.3 mm) from the base 20.1.

10

The passage extends from the inlet 22 along the tubular housing 12, through the openings 20.3 in the base, through the space between the ridge formation 18.1 and the base 20.1, and out via the outlet 24.

15

A corona discharge is therefore established in the passage in the region of the ridge formation 18.1 and, in use, oxygen flowing along the passage therefore passes through the corona discharge. The potential difference of the electrode 12 is intermittently and rapidly changed by the self-oscillating circuit, at a ratio of more than 20 kV per millimeter per nanosecond and preferably in less than

20

1 nanosecond. The effect of the rapid changes in potential is that instantaneous ionisation of oxygen is achieved by the corona discharge without the generation of substantial heat generation with accompanying energy loss, to produce



ozone from the oxygen.

The applicant has found that the yield ratio is dependant on the rate at which the relative potential difference of the electrode is changed, i.e. the faster the potential difference is changed, the more effective the apparatus 10 is able to produce ozone from oxygen.

Referring to figures 4 and 5, apparatus according to a second embodiment of the invention for producing ozone, is generally designated by reference numeral 100.

The basic working of the apparatus 100 is similar to that of apparatus 10, but the construction of apparatus 100 differs in that the housing 102 is manufactured from an insulating material. The apparatus 100 includes a first electrode 104, which comprises a conductive annulus extending around the housing 102 and a second electrode 106 disposed inside the housing 102.

The second electrode 106 is provided with an annular ridge formation 106.1 disposed in close proximity to the inner wall of the housing 102, in the region of the first electrode 104. The first electrode 104 is connected to the self-oscillating circuit and the second electrode 106 is earthed. A corona discharge is therefore established between the ridge formation 106.1 and the inner wall of the housing

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102.

It will be appreciated that a number of variations in detail are possible with a method and apparatus according to the invention for producing ozone, without  
5 departing from the scope and/or spirit of this disclosure.

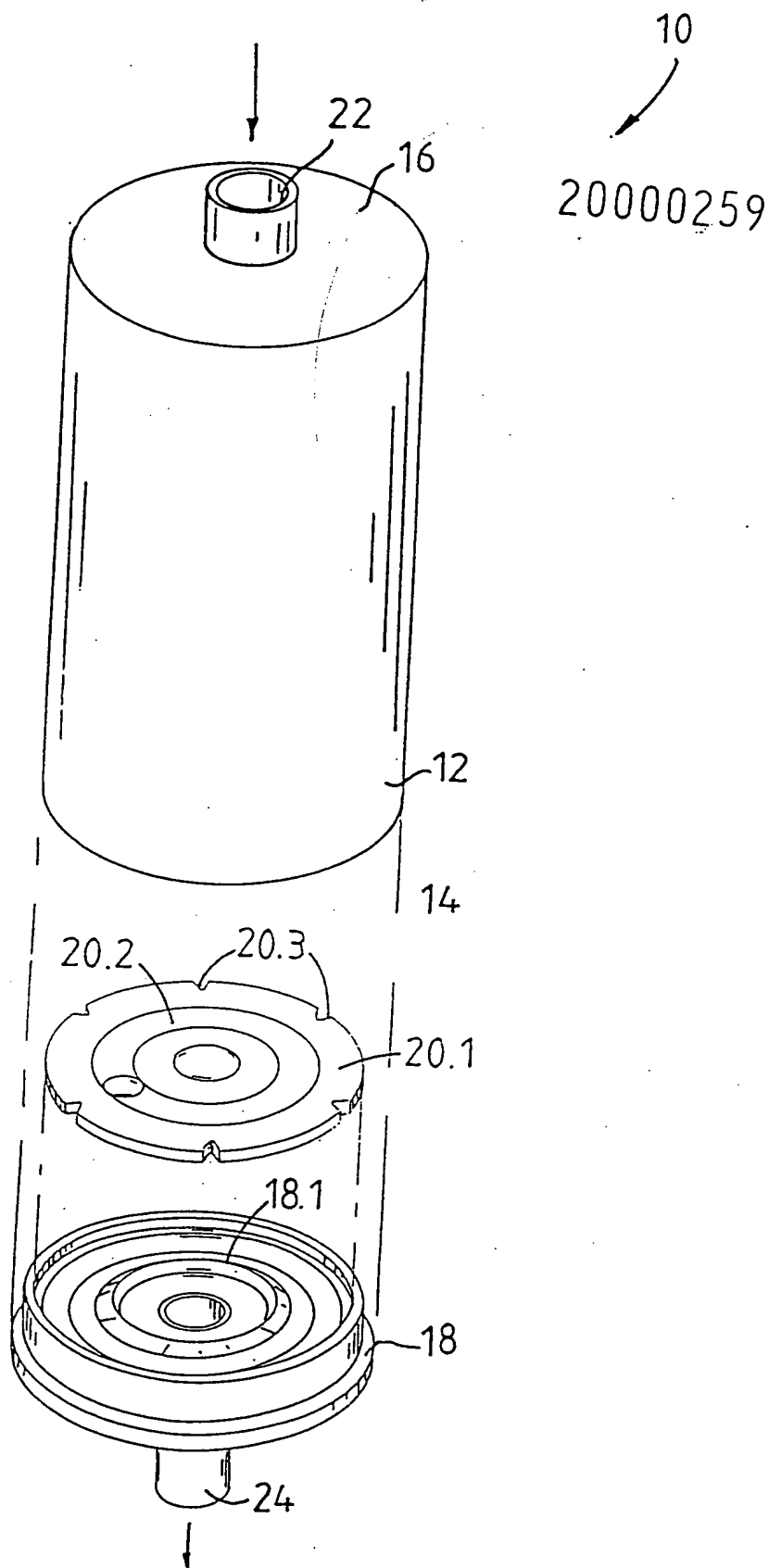
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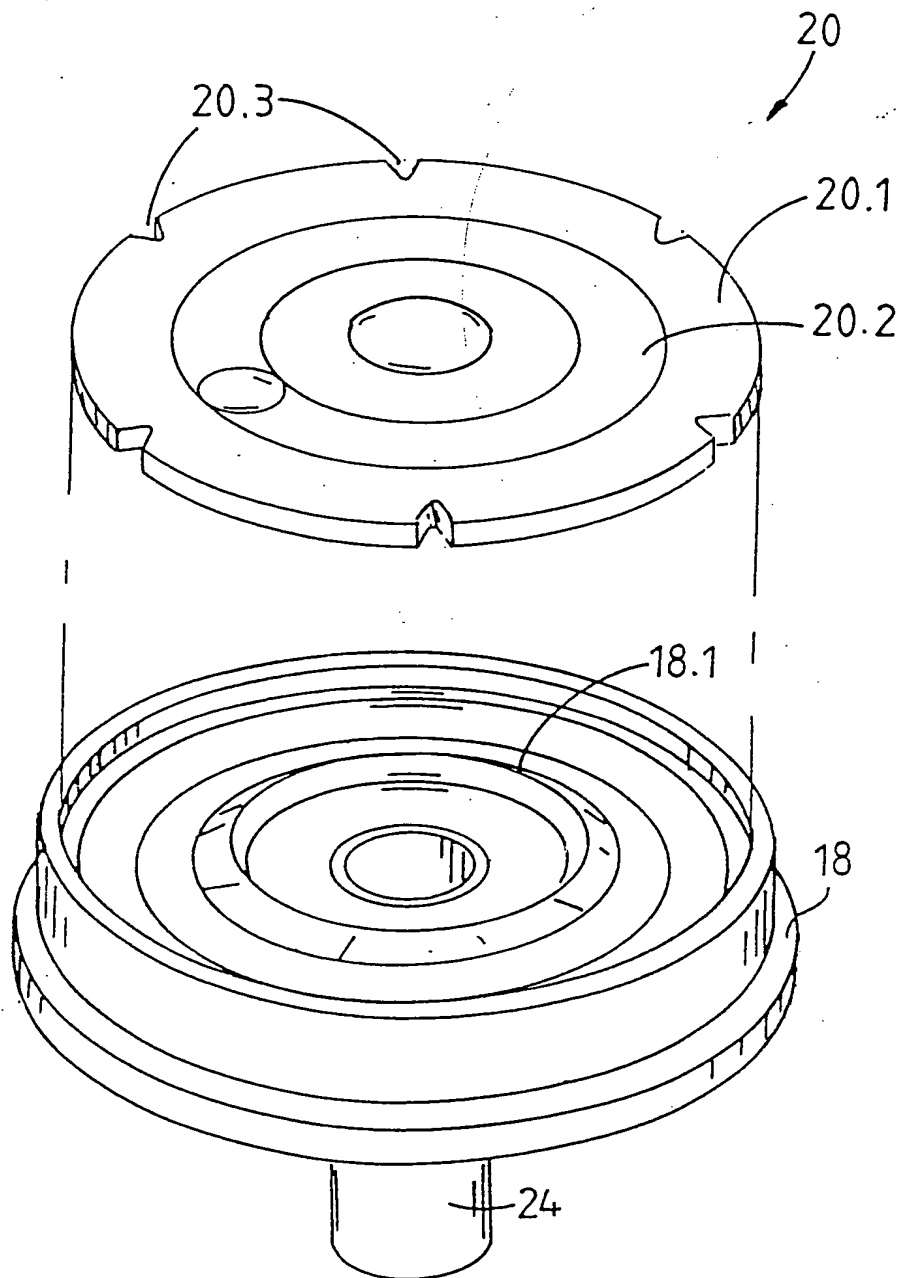
  
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D M KISCH INC

PATENT ATTORNEYS FOR APPLICANT



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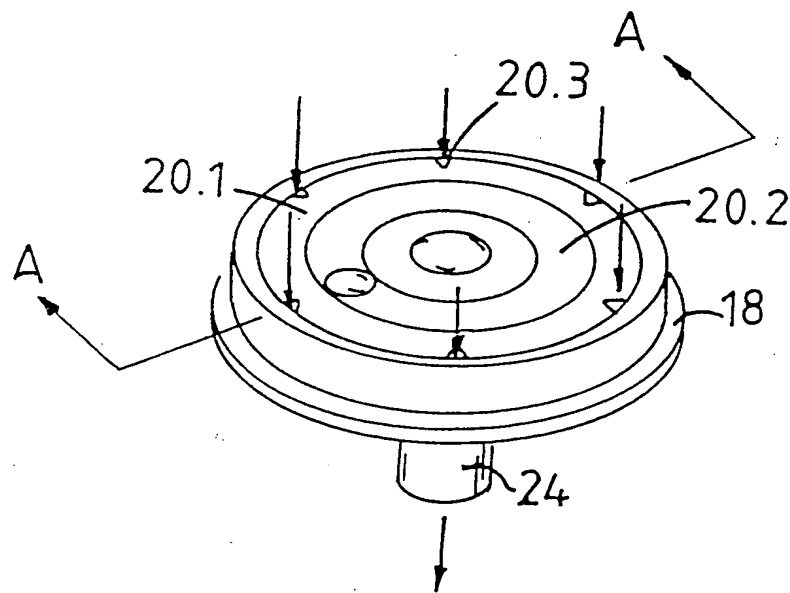


FIGURE 3

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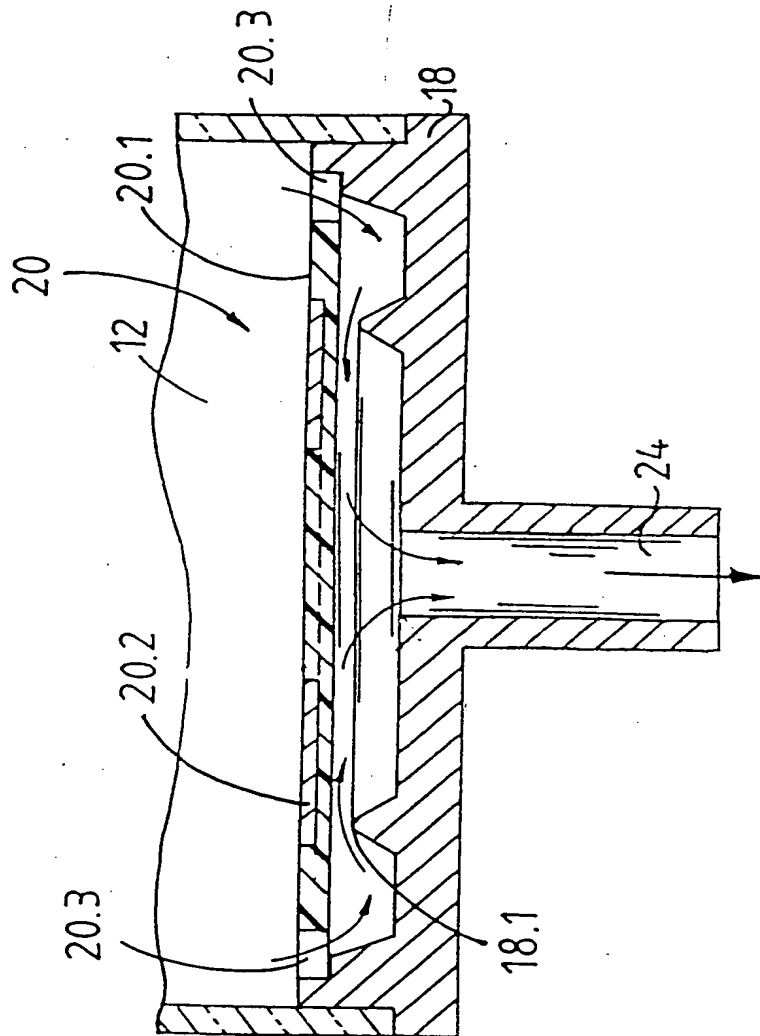


FIGURE 4

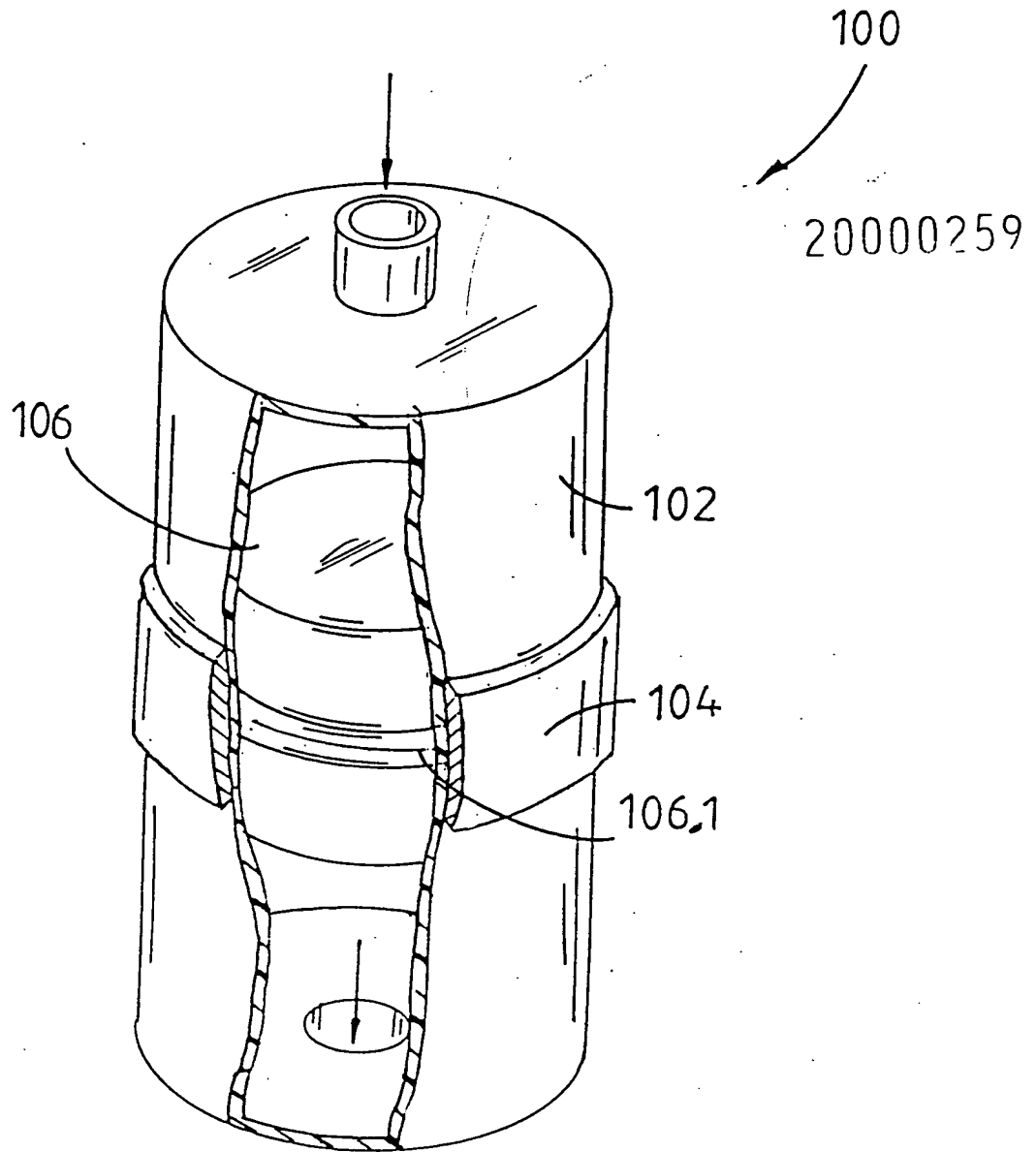


FIGURE 5

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100

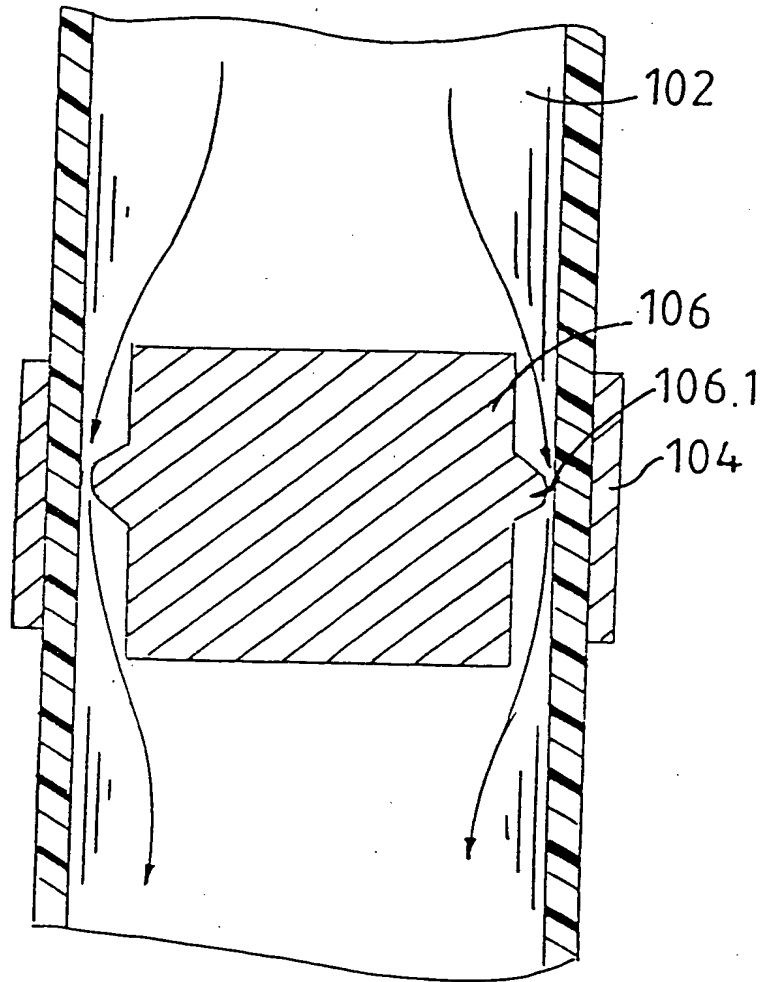


FIGURE 6